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Expressway Rapid Transit



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by George Krambles
Superintendent Research/Planning
Chicago Transit Authority

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Chicago's Congress rapid transit (top) in 1958 was the first modern application of the median strip rapid transit, but the basic concept of multi-modal use of transportation corridors was already common in the 1890's, as exemplified at Bozeman, Montana (bottom).

(Lower photo: W. C. Janssen)

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Expressway rapid transit

Chicago was the first city to apply the concept of integrated use of a right-of-way for both expressway and rapid transit, but actually the concept of a multimodal transportation corridor is an old one. Its logic makes it inevitable and the only serious questions for its future are what new modes may develop to share corridors and how the incidental conflicts between modes can be minimized to yield a harmonious whole.

The basic need for multimodal use of transportation corridors arises from the cost and difficulty of assembling right-of-way. As the world's urban population grows at explosive rates, the sheer scarcity of land looms as a factor of growing importance in the making of all policy. Giving up land even for urgently needed new transportation corridors becomes increasingly objectionable at any price in this era of increasing social awareness. Combined use of rights-of-way lessens these objections by offering offsetting advantages to more people and by utilizing land more efficiently.

STREET RAILWAYS

The first horse drawn street railways of the 1850s almost entirely used the streets of their cities. Staying away from slower traffic at curbside, their tracks could usually be found in the center of the street. Generally, the area they occupied was not exclusively for the streetcars, but had to be shared with wagons, carriages and other traffic. In the early days of unpaved streets, the car tracks provided the smoothest surface in the street and wagon wheels were often gaged to fit them. With the advent of electric motors, streetcars became the fastest traffic in the streets and many an impatient motorman sent a wagon packing off the rails and out of the way with a mixture of bell-clanging and curses. After the coming of the automobile the situation began to reverse, but it took a half-century to drive most streetcars off the streets of America. In retrospect, it seems that the fault was not in the basic idea of multimodal transportation corridors, but instead in mixing vehicles operating at widely different speeds in the same channel of the right-of-way.

Early in the development of public transit this particular defect was minimized in some places, such as New Orleans or Boston, where a center strip of a broad street could be designated for exclusive use of streetcars except at intersections.

The advantage in speed, regularity and dependability of transit service under such conditions should have been evident. Even so, many cities where streetcar tracks were in reserved areas in the center or at the side of streets yielded to the insatiable demand of the automobile for more and more right-of-way and paved over these transit



⤿ Top down:
New Orleans, Boston and Shaker Heights, Ohio,
are examples where streetcar operation in
reserved rights-of-way provide a level of transit
service superior to regular street operation in
speed, dependability and regularity.



⤿ Where it uses overhead tracks:
San Francisco's BART, now nearing completion,
has developed the idea of pleasant linear parks
to occupy the space immediately beneath hand-
some structures, which are mostly integrated
into transportation corridors that include streets
and main line railroads.

(Photo: BART)



corridors. In attempting to meet the needs of autos, however, the usefulness of streetcars was sacrificed. Those American streetcar lines that have not been abandoned generally have substantial amounts of right-of-way reserved to their exclusive use.

Unlike most other cities, New Orleans had the fortunate added idea of grassing over the full width of its "neutral grounds" and even including other attractive plantings and flowers where space permitted. These increased somewhat the difficulty of operating and maintaining car tracks, but this handicap was more than offset by creating an attractive buffer strip that may be a source of neighborhood support for transit in preference to paving over the area.

ELEVATED RAILWAYS

The elevated railway as a means of making multimodal use of right-of-way, a concept now nearly 100 years old, provided a significant improvement in separating through passengers from the interference of slow-moving local traffic. The invention made possible vast increases in the capacity of the right-of-way to move traffic and added a safe channel for dependable passenger movement at significantly higher speed than could be achieved in any then-existing street. In fact, much more improvement was accomplished by the vertical separation of traffic than would have been gained had it been possible to widen existing streets by an amount equal to the width of the elevated railway.

The early 'L's of New York and Boston were built above existing streets, and while their service soon developed into a permanent need for the community as a whole, there were few abutting property owners satisfied with the price in noise and obliteration of the sky. In Chicago, where the first 'L' was not built until 1893, this defect was only a little reduced by building most of the lines on right-of-way adjacent to mid-block alleys. Landscaped buffer strips, as in San Francisco's soon-to-be-opened Bay Area Rapid Transit, and other improvements in structure and vehicle design will hopefully re-establish the acceptability of elevated structures for rapid transit service. They offer advantages in low construction cost and are much more interesting to ride than other forms of rapid transit.

SUBWAYS

With narrow, winding streets in their central business districts, it is not surprising that London and Boston were pioneers in the development of subways as the next stage in the development of multimodal transportation corridors. City after city followed suit until today there are dozens of major cities the world over which have adopted this solution to increasing the capacity of their transportation corridors.

As of 1971, it seems probable that future solutions to problems of city transport will be acceptable only if people are distributed within the central business district primarily by subway. The high cost of a subway pleads for an alternative to be used in less concentrated areas of the city, as does the intangible value to a passenger of being able to see at all times where he is and, acknowledging today's sensitivity to human feelings, to relate to his surroundings.



⌚ About 1941 a section of the San Fernando Valley interurban trolley line of the Pacific Electric Railway had been relocated into the Hollywood Freeway median near Mulholland Drive in Calhenga Pass. Operating otherwise mostly in the middle of city streets mixed in with other traffic, this rail service was abandoned and the median was changed to more highway lanes.

(Photo: L. W. Birch)

⌚ Location of elevated rapid transit line in cleared path of future Eisenhower expressway is clearly shown in this 1953 photo, looking west at a point about two miles from the central business district. At this point today two tracks rise from between two others to interconnect new median route with existing Douglas 'L' branch in background.

⌚ About at the midpoint of construction, this 1955 photo shows how the median provided an economical solution to the transit relocation problem. Incidental benefit was the elimination of about $6\frac{1}{2}$ miles of obsolete steel 'L' structure with its costly maintenance and esthetic objections. View east about $5\frac{1}{2}$ miles from CBD.

⌚ By 1967 the line had been partially re-equipped with new air-conditioned rapid transit cars. With a rush period load of 500 people, the six-car train comfortably seats more people than are in all the automobiles in the picture combined.

EXPRESSWAY TRANSIT CONCEPT

The newest solution to the problem of providing the grade-separated right-of-way that is essential to rapid transit is that of utilizing the median of an expressway. This form of grade-separated limited access urban highway began to appear on the American city scene in the 1950s. Chicago's Congress (now Eisenhower, I-90) expressway needed a right-of-way about 550 ft. wide extending the full width of the city in an east-west direction from the central business district. In its path was the track and structure that had been built in 1895 by the Metropolitan West Side Elevated Railway on its own right-of-way varying up to 75 ft. in width. Taking into account its length, this transit land was the most important single land acquisition needed for the highway agencies to assemble the expressway right-of-way.

In the process of consideration of a full range of alternatives for replacing or relocating the rapid transit service, the concept of median strip rail rapid transit emerged. Under somewhat different circumstances, a short portion of the San Fernando Valley interurban trolley line of the Pacific Electric Railway had been relocated into the median of the Hollywood Freeway a few years earlier, but Chicago was the first full scale rapid transit application.

CONGRESS RAPID TRANSIT

The Congress rapid transit thus replaced the old Garfield elevated route. The relocation was completed in stages between 1958 and 1960. It occupies about nine lineal miles of expressway, of which two-thirds is in median between the eastbound and westbound highway lanes, the remaining portion being along the south edge of the highway. This portion is especially interesting in that it incorporates a double track main line freight railroad, the Baltimore & Ohio Chicago Terminal, over which are operated trains of the Soo Line. Using the side, rather than the median, for the tracks here was a solution that minimized the cost of providing the industrial access needed by the railroad. However, the left hand expressway access that resulted has some disadvantages.

The operating results of the relocation of the old Garfield elevated railway into the Congress median strip rapid transit made it immediately clear that a significant new way had been found to expedite the extension of grade separated transit into new areas of the city where expressways were being planned. Cost studies showed that the cost division between highway and transit for an integrated route is in the order of 4/5 road to 1/5 rail. Passenger loading studies on the Congress installation, where relatively modest density transit routes were involved, showed the number of passengers in the peak period served by transit exceeded those of the highway and there was obviously substantial capacity for further traffic growth only in the rail portion of the corridor. More than 115,000 riders per weekday are served by CTA trains in the Congress expressway.



Ⓐ Distribution from the Dan Ryan rapid transit into coordinated local and interurban bus feeder systems is provided through interchange stations developed directly over the expressway. About 40,000 people per weekday pass in, out or through the 95th Street terminal station (top). Almost 20,000 use the modest 69th station (next down) not including passengers riding through it on trains.



Ⓔ Reversible exclusive busway in the Shirley highway into northern Virginia from Washington is shown under early test. Now in service but a few months, and with construction of some parts still to be completed, this service is being expanded as more people utilize the advantages which are obvious in this scene.

Ⓔ In Mexico City, all grade crossings at intersections have been removed over the length of transit occupancy of a major arterial to permit rapid transit operation in the median. (Photo: Sistema de Transporte Colectivo)

DAN RYAN/KENNEDY PLANNING

Chicago therefore lost no time in adapting the designs for the northwest (now Kennedy), south (Dan Ryan) and southwest (Stevenson) expressways so that there would be space for transit in the medians. The resulting increase in cost of cross bridges and excavation was not as much as one might think. For one thing, experience with the early expressways indicated that broad medians were needed anyway to improve traffic speed and safety. Occupying such medians with rail transit is not considered to significantly detract from those advantages, which primarily derive from insulating traffic going in opposing directions. Another point in the taking of land for expressway right-of-way is that there is no economy in leaving behind unusable remainders. If two parallel streets are separated by 594 ft. of land, there may be no market for a remainder if only 550 ft. is taken for the expressway, and the whole must be acquired. By coincidence, a double track rail transit line with island station platforms can comfortably fit into about 43 ft. of width. Thus, in some cases, providing for rapid transit in an expressway median represents an insignificant additional cost for land.

The Kennedy expressway opened for highway traffic in 1961 and the Dan Ryan in 1962. At the time, there was no available funding for the median transit tracks, stations and cars. Transit service was begun in these expressways, therefore, with motor buses operating in the regular highway lanes. Although the bus service offered improvement over previously existing local bus services on the nearest paralleling surface streets, the demand was not enough to require more than rush period trips, five days a week.

DAN RYAN/KENNEDY LINES BUILT

In 1964, Congress created legislation offering, for the first time, federal assistance in the funding of equipment and construction for transit. In 1966 Mayor Daley proposed a public improvements bond issue which included rail transit extensions in the Kennedy and Dan Ryan expressways.

The transit bond issue succeeded by about 2 to 1, and the two new rapid transit lines went into design. After approval of requests for federal grant assistance, construction began. The Dan Ryan extension began operation September 28, 1969 and the Kennedy extension began February 1, 1970. Over 100,000 rides per weekday are now being provided by the Dan Ryan and 60,000 on the Kennedy, just considering the new parts of each. Provisions were made in the design and construction for future transit extensions to be made in the Calumet (I-94) and Dan Ryan (I-57) expressways from the present south terminal station at 95th Street. With 35% of the extension's patrons passing through that terminal station, the probable need for early extension farther south is evident. Similarly, provision for future extension in the Kennedy (I-194) expressway beyond Jefferson Park to the passenger terminals at O'Hare International Airport was made. With more than 1/3 of the users of the Kennedy extension passing through its Jefferson Park terminal the

likelihood of demand for early outward extension is also clear. This future extension is currently opposed by the privately-owned suburban railway which has a service operating in the same general area and wants to be protected against diversion of riders, many of whom are wholly in-city passengers. It took a similar position with respect to the Jefferson Park extension. However, actual traffic experiences have been that while 60,000 weekday rides are provided on that portion of the transit line, the railway noted a decline of about 1100 rides, indicating that identical markets are not in fact being served. For the present, CTA service linkage between Jefferson Park and O'Hare airport is provided by the #40 O'Harexpress non-stop bus.

The use of expressway medians for transit is not automatically assured of success, of course, although in Chicago the decision was made that in all future expressway planning the door will be left open for subsequent, if not initial, transit installations.

STEVENSON AND LAKE SHORE DRIVE TRANSIT

A transit median is available in the Stevenson (I-55) expressway beyond about Damen Avenue. The immediate environs of most of this route, which extends to the southwest along the route of the old Illinois and Michigan Canal, are occupied by such uses as tank farms, truck and rail terminals, power stations and similar low-population land uses. As a transit route, therefore, its value is not for distribution of passengers but as a non-stop link from the center city to outlying developments which are not directly on or along the way. This is too small a market as of 1971 to justify immediate construction of special transit facilities and interim service is being provided by express buses operating in the regular traffic lanes. Portions of the north and south Lake Shore Drives, which predate the transit median concept, are similarly used by CTA express buses.

CROSSTOWN PLANNING

According to the comprehensive plan of the City of Chicago, the one major in-city expressway route remaining to be built is the Crosstown route. It will follow Cicero Avenue south from the Kennedy/Edens junction to about 75th Street, which it will follow east to the Dan Ryan. This will form a circumferential corridor, linking together the older radial highways, forming a bypass to relieve the vehicular burden in the central part of the city. The form of transit that will be provided in this route is currently the subject of extensive study. However, enough is known already to see that it will incorporate a number of differences from previous Chicago installations, since the traffic requirements and physical conditions are substantially different. Also, at least initially, Crosstown transit will probably be provided by buses operating in the portion of right-of-way allocated to exclusive transit use.

OTHER EXPRESSWAY TRANSIT

At this writing, Chicago remains the only American city to operate rail rapid transit in expressways. The new Line 2 in Mexico City operates in the median of Calzada de Tlalpan, a major arterial from which all grade crossings at intersections were removed over the length of transit occupancy. A portion of the San Francisco BART system now being completed will be in median. Exclusive bus lanes have been put into operation with excellent results in a few places, notably on the Shirley highway south of Washington and approaching the Lincoln tunnel from New Jersey.

Federal funding aid for about 11 miles of busway in the San Bernardino Freeway in the Los Angeles area west of El Monte has just been announced. About 7 miles will be a single 17-foot lane in the median, having common shoulders with the freeway lanes in each direction. About 4 miles will be a 54-foot wide two-way busway adjacent to the freeway and separated from it by a positive barrier. Buses are to have exclusive use of these lanes only during weekday rush hours for the first two years of service, and after that will have to share the space with a metered flow of other traffic.

CONSTRUCTION COSTS

At present costs are sliding upward at such a rapid rate as to make it difficult to work with comparative cost figures of two jobs not done at the same time. However, the cost of putting rapid transit into the expressway portions of the Dan Ryan and Kennedy projects in Chicago averaged only about \$4 million per lineal mile. The two complete extensions, fifteen miles in length, including all infrastructure for a double-track railroad, substations, cable, communications, signalling, about a mile each of subway and elevated, fifteen stations, 150 new cars plus cab signal work on 410 cars, altogether cost an average of \$7.5 million per mile. This is estimated to be less than half the cost of a comparable facility wholly in subway.

SUMMARY

Providing rapid transit in the median of portions of urban expressways has proved to be a practical and economic approach in expanding Chicago's transportation network. It creates for transit an opportunity to compete effectively with other modes in meeting travel needs in metropolitan areas. The concept of multimodal use of right-of-way, with independent exclusive channels for transit and highway vehicles, is a significant step in fulfilling the goal of balanced transportation. It provides to transit riders speed and convenience of access that would otherwise only have been available to automobile users.

An expressway route designed primarily for the use of road vehicles might not be an ideal route for transit if it does not contact the

concentrations of population within an urban area. However, the geography of Chicago is generally such that the integration of transit into its expressways has been very effective in serving the public's needs. Application of the idea has ended a pause of over half-a-century in expanding the within-city service coverage area of rapid transit.



Map left shows use of Chicago's expressway system by CTA transit. Darkest lines denote sections with rail rapid service, while medium density denotes bus service.

Reading south from the upper part of the map:

Rail rapid transit (Service at all hours daily)

Milwaukee service of the West-Northwest route occupies median of Kennedy (I-94 and I-194) between Kimball and Foster, about 5½ miles. In service 1970.

Congress-Douglas service of the West-Northwest route in the Eisenhower (I-90) between Halsted and Desplaines, about 9 miles, of which about 2/3 is in median and 1/3 along south edge. In service in sections between 1958 and 1960.

Dan Ryan service of the West-South route occupies median of Dan Ryan (I-90/94) between 28th and 99th, about 9 miles. In service 1969.

Express buses (all operating in regular lanes)

40-O'Hare express in Kennedy (I-194/594) between Foster and O'Hare airport, about 8 miles. In service 1970. Service at all hours daily.

62a-Archer in Stevenson (I-55) and Dan Ryan (I-90/94) between Canalport and Cicero, about 5 miles. In service 1964-1966 in sections. Service in rush direction during peak hours Monday-Friday.

4a-Altgeld Gardens in Calumet (I-94) between 115th and 130th, about 2 miles. In service 1970. Service 0600-1900 Monday through Friday.

Routes 2a, 5, 151a, 153a have operated in about 10 miles of the north or south Lake Shore Drive for more than 25 years. Routes 6, 19, 36a, 111a which operated in the Kennedy or Dan Ryan, from 1961-1962 were replaced by rapid transit in 1969-1970. Bus service on these routes was in rush direction during peak hours, Monday through Friday.

Medians available for possible future transit.

Kennedy (I-194) Foster to O'Hare airport, about 6½ miles.

Stevenson (I-55) Damen to Harlem, about 5 miles.

Dan Ryan (I-57) 99th to 127th, about 4 miles.

Calumet (I-94) 99th to 103rd, about 3 miles.